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Causes of Failure with Artificial Pneumothorax.—Of the 600 cases in which an artificial pneumothorax was attempted or established, 274 have terminated fatally. These fatal cases fall into two groups: (1) those in which improvement was noted, in many instances to the extent of clinical recovery, but which eventually terminated fatally, and (2) those in which the disease was progressively fatal in spite of treatment. There are 80 cases in the first group and the cause of failure, in the order of frequency, was adhesions preventing satisfactory compression, 22; extraneous causes (not related to tuberculosis), 12; unsatisfactory social and economic conditions, 11; treatment abandoned voluntarily, 10; progression of disease in contralateral lung, 9; enteritis, laryngitis and other tuberculous complications not dependent upon treatment, 7; tube drainage of purulent exudate, 3; postpneumothorax progression of disease in compressed lung, 3; widespread character of the disease, 3; aspiration tuberculosis following hemorrhage, 2; early obliterating pneumothorax, 2; spontaneous pneumothorax, 1; and sudden death due to postpneumothorax hemorrhage, 1. In the second group there were 188 progressively fatal cases in which a pneumothorax was attempted (includes 80 no-free-space cases) or established. The cause of failure in order of frequency was no free space, 80; widespread character of the disease (therapeutic pneumothorax only, *ultimum-refugium* cases), 50; adhesions preventing satisfactory compression, 21; serious tuberculous complications (enteritis, laryngitis and meningitis), 14; progression of the disease in contralateral lung, 13; and spontaneous pneumothorax, 2. Adhesions were a cause of failure in almost direct proportion to the duration, intensity and widespread character of the disease. This is evidenced by the fact that, as satisfactory compressions become less frequent, failures from all causes increased. This evidence suggests that artificial pneumothorax should be used earlier in the disease, and pulmonary tuberculosis sufficiently serious to justify the assumption that a cure is doubtful by the ordinary methods should have the advantage of an artificial pneumothorax at a time when there is less likelihood of its failure because of adhesions. No tuberculous lung disease to the extent of requiring a pneumothorax is free from adhesions. These may not be demonstrable by roentgenological or physical diagnostic methods, but their presence can be proved by means of the thoracoscope. Proper judgment should be exercised in using high pressures when dealing with adhesions, on account of the danger of too rapid separation which may cause exudate formation or tear the lung cortex, and thus cause lung perforation and empyema. If any portion of the compressed lung is held attached to the chest-wall, even by adhesion bands, sound waves are conducted to and diffused over that region of the chest-wall. The separation of adhesions is nearly always attended with exudate, and frequent careful roentgenological examinations will reveal the presence of exudate at some time during the course of pneumothorax treatment. From a clinical standpoint, in the presence of a satisfactory compression, any unexplainable fever or unexplainable quantities of bacilli-laden sputum should put one on the alert as to changes in the opposite lung. Dependence on manometer readings alone in regulating the amount of gas will result in many mistakes. The evolution of a subpleural tuberculous process, or at least the ulceration of a superficial caseous focus, is a factor of more importance in empyema formation than tearing the lung cortex while stretching adhesions. The open operation of tubercu-

lous purulent exudate is to be strongly condemned. Lung perforation during the course of artificial pneumothorax occurs with much greater frequency than is generally realized. *Conclusions:* Adhesions are the most frequent cause of failure of artificial pneumothorax, 40 per cent of failures being due to them. They are present in almost direct proportion to the duration and intensity of the disease, causing over 24 per cent of the failures in earlier cases which improved, but were eventually fatal, and 54 per cent of the failures in the more advanced cases which were progressively fatal. Artificial pneumothorax is not advocated in early infiltration cases, but it is a mistake to wait until compelled to use it because of failure in the usual therapy. If excavation of the lung tissue has taken place, and the outcome of the usual therapeutic procedures is in doubt, then artificial pneumothorax should be considered. In cavity cases, provided that there are no contraindications, the sooner artificial pneumothorax is instituted the better. Artificial pneumothorax exercises a beneficial influence on the active disease in the noncompressed lung if the latter is not too extensive. While 58 per cent of the cases had active or quiescent disease in the noncompressed lung, only 12 per cent were unfavorably influenced. Progression of the disease to the noncollapsed lung was responsible for 8 per cent of failures. Serous exudates occurred in practically every case at some time during pneumothorax treatment, and in 30 per cent it was in quantities of 50 cc. or more; but as long as it remained serous it was never a cause of failure, and even when becoming purulent was seldom a cause of failure. Tuberculous enteritis, when so severe as to interfere with the patient's nutrition and to be unresponsive to treatment, is a contraindication for artificial pneumothorax. Tuberculous laryngitis, unless so severe that the patient cannot be nourished, is not a contraindication. Lung perforation and obliterative pneumothorax were infrequent causes of failure.—*The Causes of Failure in the Treatment of Pulmonary Tuberculosis by Artificial Pneumothorax; Based on Observations Made on 600 Cases During a Period of Twelve Years, R. W. Matson, R. C. Matson and M. Bisaillon, Tubercle, April, 1924, vii, 325.*—(*B. T. McM.*)

Artificial Pneumothorax in Cardiopathic Tuberculous Patients.—Three patients with unilateral tuberculous lesions were presented, in whom, despite the presence of cardiac lesions, artificial pneumothorax was successfully practised. One, a young girl, has rheumatic endocarditis with a mitral lesion; the other two had pulmonic stenosis with patent ventricular septum. In the discussion, Rist remarked that he had successfully treated a case of mitral stenosis with cyanosis by pneumothorax.—*Le pneumothorax artificiel chez les tuberculeux atteints de cardiopathies, L. Bernard, M. Salmon and Thomas, Meeting, Soc. Méd. d. Hôp d. Paris, June 6, 1924, reported in Presse Méd June 14, 1924, no. 48, p. 524.*—(*A. P.*)

Acute Lung Abscess in Child Cured by Artificial Pneumothorax.—Few clinicians are aware of the striking success which may attend the use of artificial pneumothorax in selected cases of abscess of the lung, although the procedure is by no means new. Only three cases so treated in children were found in a review of medical literature, these having been reported by Tewksbury (1919), Rist (1919) and Gilbert (1920). J. B. Murphy in 1898 clearly formulated the underlying principles, saying, "I am convinced that abscess without adhesions, and with bronchial communications, should not be treated by incision and drainage through the chest wall, but by producing collapse of the lung," etc. Two essential conditions for the successful application of pneumothorax therapy are a free pleural cavity, and communication of the abscess with a bronchus. As pleural adhesions are apt to develop early, delay in the hope of a spontaneous recovery will almost surely preclude the use of pneumothorax. In the case reported, only one injection of 450 cc. of air was given, with an immediate symptomatic and clinical result. Reëxpansion of the lung occurred in about two weeks, the patient was discharged well, and a later X-ray showed practically negative lung fields.—*Report of an Acute Lung Abscess in a Child Cured by Artificial Pneumothorax, G. M. Balboni, Boston M. & S. J., June 5, 1923, cxc, 965.*—(*A. P.*)

Treatment of Tuberculous Empyema in Artificial Pneumothorax.—In two cases of tuberculous empyema complicating artificial pneumothorax irrigation of the pleural cavity with *iodonascin*, a preparation similar to Pregl's solution and containing 0.03 to 0.04 per cent iodine, induced comparatively rapid healing. Leaving a small amount of the iodine solution in the pleural cavity after each irrigation hastened absorption of the exudate.—*Zur Behandlung des tuberkulösen Empyems bei künstlichem Pneumothorax, L. Lagrèze, München. med. Wchnschr., February 22, 1924, 237.*—(*E. R. L.*)

Pleural Effusion in Artificial Pneumothorax.—Two simple methods are described, each requiring the insertion into the chest of only a single needle for the purpose of aspira-

tion and replacement with air, one devised by Forlanini, the other by Morelli, based on Forlanini's idea. Both are in common use in Pavia in preference to the insertion of two needles, as recommended in the British report. Forlanini's apparatus consists of two bottles, with outlets near their bases, connected by rubber tubing; one of these contains a rubber cork perforated by two tubes, one of which is attached to the needle in the chest wall. Aspiration is performed by allowing fluid to pass from this bottle to the other, thus creating a negative pressure in the first; and gas replacement, by the reverse procedure, raising the other bottle. Morelli's instrument consists of a graduated bottle connected instead by way of a tube with a three-way stopcock to a large 100 or 200 cc. syringe by which a negative or positive pressure is produced and, in the case of air injection, the amount accurately measured. For the purpose of washing out the pleura, a simple addition to this apparatus suffices. —*Pleural Effusions in Artificial Pneumothorax. A Note on Some Methods Used in the Royal University of Pavia, T. S. Nelson, Tubercle, March, 1924, v, 265.*—(*A. P.*)

Experiments on Artificial Pneumothorax.—Double-sided pneumothorax was performed in 43 dogs, cats and rabbits with the following results: *1:* Life is possible in both closed and open double-sided pneumothorax. *2:* In open pneumothorax life is possible provided the opening does not exceed one-half that of the lumen of the main bronchus. *3:* Closed double pneumothorax has a more favorable course than narrow open pneumothorax. Studies on the respiratory movements in double pneumothorax showed that: *1:* Both closed and open pneumothorax caused more energetic respiration than normal; in narrow open pneumothorax it was deeper and more rapid than in closed pneumothorax. *2:* Wide open pneumothorax caused first, a prompt increased depth and later, an asphyxial type of breathing. The intrapleural pressure measured with a manometer in double pneumothorax showed: *1:* In closed as well as narrow open pneumothorax there is a sufficient variation in the intrapleural pressure. *2:* The indrawing of air in adhesion-free spaces reveals normal pressures. The lung collapse in open-pneumothorax experiments revealed that: *1:* The lung collapses completely, the speed depending on the pleural opening. *2:* During this time there occur fruitless efforts to press the air out of the pleural spaces with active expiratory efforts on the part of the thorax. Adhesions or bandaging can result in reëxpansion of the lungs. The carbon-dioxide output and oxygen absorption are diminished. The total gas metabolism, however, exceeds normal, and the respiratory coefficient is increased. The blood pressure is not appreciably increased.—*Die Pathologie des Pneumothorax in Bezug zur Frage des intrapleuralen Druckes, M. Friedland, Dissertation, Kasan, 1922, Abstract from Centralbl. f. d. ges. Tuberk.-Forsch., February, 1924, xxi, 395.*—(*H. J. C.*)

Artificial Pneumothorax and Change of Altitude.—The patient who volunteered for this experiment was a case of Dr. Dumarest's with right-sided pneumothorax of three years' standing. He was sent by railway from Chamonix (1050 metres) to Montenvers (1914 metres) and back again, the intrapleural pressure being taken before starting, at Montenvers, and again on his return to Chamonix. He remained approximately one hour and a half at Montenvers. The pressure in his chest 35 minutes before leaving Chamonix was +9 and 20 minutes after his arrival at Montenvers, or one hour and 45 minutes after the first reading, was +17. Half way up he had complained of tightness in the chest, had a slight dry cough and slight pain at the opposite (left) base, and on auscultation at Montenvers friction rubs were heard there. During his short stay these symptoms, together with a slight shortness of breath, rapidly subsided. The patient arrived back at Chamonix three hours after his departure, and was examined thirty minutes later, when the pleural rubs had disappeared and the intrapleural pressure was found to be 0. The following conclusions were drawn: 1. Adaptation to change in altitude is not immediate; hence very rapid ascents are inadvisable in pneumothorax patients and may lead to accidents from excessive pressure. 2. The change in intrapleural pressure is only a fraction of the difference in barometric pressure between different localities, probably due to the initial rapidity of absorption and diffusion from the pleura. When the patient returned to Chamonix it was necessary to introduce 100 cc. of gas to restore the initial pressure, this representing the amount diffused out on his journey. This diffused-out gas does not return after descent to the former level, because the diffusion is all from and not towards the pleural cavity. 3. The excessive pressure led immediately to symptoms on the opposite side, which disappeared when the pressure was lowered. In this case they became manifest as a pleuritis.—*Pneumothorax artificiel et changement d'altitude, C. Mantoux, Rev. d. l. Tuberc., December, 1923, vi, 626.*—(*A. P.*)

Artificial Pneumothorax for Early Pulmonary Tuberculosis.—Inasmuch as a very large percentage of patients with well

developed pulmonary tuberculosis die of the disease before many years, and since artificial pneumothorax is the most satisfactory means of controlling progressive unilateral disease, it seems advisable not to postpone the induction of a pneumothorax while giving other means a trial. The earlier the collapse is brought about the less likely it is that adhesions will prevent it from being complete. A successful pneumothorax which frees the patient from cough, enables him to perform useful work, and permits him to be among his friends without endangering their health, is greatly to be preferred to a life of invalidism with its remote prospect of improvement, which in most cases is the only alternative to the collapse of one lung. The partial recovery achieved by a pneumothorax may be brought about in a much shorter time than improvement by other methods. The permanent loss of one lung should, of course, be decisive in determining the patient's choice of occupation and residence.—*The Treatment of Consumption by Artificial Pneumothorax, H. B. Shaw, Practitioner, 1924, cxii, 99.*—(*E. C.*)

Pleuropulmonary Fistula Treated by Oleothorax.—The patient, in addition to pyopneumothorax, had a ruptured cavity. After three months, an oleothorax was produced by the injection of 150 cc. of oil, followed a few minutes later by its expectoration. The patient then ceased to spit pus and his general condition improved. Small fistulas at the base, however, prevented the continuance of treatment.—*Fistula pleuro-pulmonaire traité par l'oléothorax, Lévy-Valensi, Meeting, Soc. Méd. d. Hôp. d. Paris, June 6, 1924, reported in Presse Méd., June 14, 1924, no. 48, p. 524.*—(*A. P.*)

Extrapleural Thoracoplasty in Treatment of Pulmonary Tuberculosis.—This method of therapy naturally followed the success attained by artificial pneumothorax in cases doing badly under the ordinary hygienic treatment. Brauer and Friedrich's operation certainly accomplished pulmonary collapse, but with grave operative risks. By substituting a flaccid envelope for the bony chest wall, it led to mediastinal imbalance and displacement. This was associated with serious circulatory embarrassment, and tuberculous involvement of the other lung was favored. The method of paravertebral rib resection introduced by Sauerbruch is now employed and permits of sufficient pulmonary collapse. The ribs must be resected as near as possible to the vertebral column, and all but the last are included. However, when the cupola of the lung has become retracted section of the first rib may be dispensed with in favor of apicolysis. Resection of the eleventh rib may also be omitted. Operation in two stages is generally advisable, beginning with the five or six lower ribs and resecting the others two or three weeks later. This guards the lower part of the lung against massive inoculation by tuberculous products expelled from the upper lobe. Local anesthesia presents undoubted advantages but requires patience, calmness and a fair amount of strength on the patient's part. Bérard prefers general anesthesia with ethyl chloride or nitrous oxide-oxygen to ether or chloroform. For the first few days after operation the patients are often uncomfortable and somewhat dyspneic, and the pulse is weak; perhaps the expectoration will be increased. The pulmonary volume immediately after a thoracoplasty, according to Dumarest and Bérard, is about a third to one-half that of the hemithorax. The total lung volume is then reduced to about two-thirds. Such pulmonary collapse always remains inferior to that produced by a complete pneumothorax, and generally the apical portion is least collapsed. The esthetic inconveniences of thoracoplasty may be reduced to a minimum. One interesting thing often seen following rib resection is a union of the anterior section of the rib below the posterior, giving a zig-zag formation. From the clinical point of view, amelioration of symptoms usually occurs much more slowly than with pneumothorax, and the abnormal physical signs often remain very prominent. The persistence of moist râles gives the illusion of a serious ulcerative process. Among the complications deserving of mention are intercostal neuralgia, due to the pressure of scar tissue, and also paresthesia, hypoesthesia and edema of the upper extremity due to compression of the brachial plexus, and occasionally bronchiectatic formation due to the pull of scar tissue. The indications for thoracoplasty are more restricted than those of pneumothorax, as it is a more radical and severe procedure, even though the patient is not exposed to the pleuritic complications that often occur with pneumothorax. Its most important indication is to replace an unsuccessful pneumothorax, but it must be realized that extension in the opposite lung is more likely to occur after thoracoplasty than after pneumothorax, and that, therefore, its functional capacity and integrity must be very carefully determined beforehand, if the operation is not to be discredited. The patient's general condition must be good enough to withstand the operative shock. On the other hand, surgery is not indicated unless the disease is severe or extensive enough to compromise life, or other measures

have failed to check its progress or afford relief. The most favorable forms of operation are those in which there is spontaneous tendency to retraction of the lung and sclerosis. Among accessory indications are a prematurely resorbed or insufficient pneumothorax, and one with a fistulous bronchial communication. The classical treatment of purulent pleurisy by thoracoplasty does not effect a permanent cure in those of tuberculous origin. Thoracoplasty permits the obliteration of the suppurating cavity and at the same time facilitates the closure of the fistula in the lung. A somewhat more doubtful indication for thoracoplasty is in the case of basal lesions of the lung. The results of the operation in the hands of Bérard and Dumarest, Brauer, Sauerbruch, Saugman, Stöcklin, and Jacobaeus and Key are given. A final judgment is thought premature, but it is urged that thoracoplasty be given a more extensive trial. It will certainly relieve a certain number of patients otherwise doomed. A full description of the operation is given, with illustrations.—*La thoracoplastie extrapleurale dans le traitment de la tuberculose pulmonaires, J. Moreau and E. Albrechts, Rev. Belge d. l. Tuberc., February, 1924, no. 2, 266.*—(*A. P.*)

Purulent Interlobar Pleurisy with Bronchial Fistula Cured by Extrapleural Thoracoplasty.—The indications for extrapleural thoracoplasty are considered the same in fistulous interlobar pleurisy as in pulmonary tuberculosis when adhesions render pneumothorax impracticable. General narcosis is to be avoided as it increases toxemia, and paravertebral anesthesia should be used, supplemented if necessary by a few whiffs of ethyl chloride. If the degree of collapse following the first resection is insufficient further resection should be done. A case history is given.—*Pleurésie purulente interlobaire avec fistule bronchique guérie par thoracoplastie extrapleurale, C. Duprez and R. Loicq., Rev. Belge d. l. Tuberc., February, 1924, no. 2, 84.*—(*A. P.*)

Combined Tuberculin and Artificial Pneumothorax Treatment of Tuberculosis.—Systematic and prudent attempts have been made at the sanatoria of LaHulpe-Waterloo to combine the advantages of the two methods. Two objects are sought from the use of tuberculin: (1) to elicit some hypothetical antibody formation and augment the natural defenses against the bacillus and its poisons, (2) to elicit some reaction in the lesion leading to elimination and cicatrization. The tuberculin therapy is regarded as the principal element in the mixed cure. Treatment is begun by small doses of purified solid tuberculin (0.002 mgm.). Toward the fifth or sixth injection, lung collapse is begun, and continued at suitable intervals and so spaced as not to lead to confusing reactions. Careful observation is required, and the process of putting the lung at rest usually requires five or six weeks. The absence of reactions in the sound lung following tuberculin injections is a good guarantee of its integrity. A focal reaction prudently managed is not a matter of gravity, but a brutal autotuberculinization ought by all means to be avoided, and here the collapse of the lung acts mechanically as a restraining influence and controls the extent and degree of reaction. The process of cicatrization is likewise aided by the lymphatic stasis set up. *Summary:* 1. Tuberculin therapy produces definite results only when focal changes result. 2. The focal reaction in a curative sense is aided by a mechanical and physiological action of lung collapse. 3. The focal reaction in a harmful sense is prevented or limited by lung collapse. 4. The focal reaction can influence the intrapleural pressure; the tissues seem more yielding following such a reaction. 5. Tuberculin can serve as a control for the healthy lung.—*Tuberculine et pneumothorax artificial: essais de cure mixte, M. & P. Toussaint, Rev. d. l. Tuberc., December, 1923, vi, 614.*—(*A. P.*)

Tuberculin Treatment.—In order to achieve success in therapeutic immunization certain factors are necessary: (1) the patient must be able to respond to the stimulus, (2) the antigen must be of good quality and complete, and (3) it must be given in proper doses and at proper intervals. There is only one condition in which a patient is incapable of responding to an antigenic stimulus; that is when the resistance of the endothelial cells of his capillaries is broken down by an overwhelming sudden assault of the invading microbe, as in acute hemorrhagic infections, or slowly, in such an infection as chronic phthisis. Fever is not a contraindication to starting tuberculin treatment. In order to survive in the animal body a pathogenic microbe must develop a ferment (toxin) or ferments by which it can prepare its food by killing living protoplasm. It is generally agreed that the tubercle bacillus has acquired its wax-saturated constitution as an additional defense against the animal body, and this has made a difficulty in producing a satisfactory antigen. If the antigen is to be complete it must contain this waxy or fatty substance. Koch tried to overcome the difficulty by using filtrates of old broth cultures on which autolysis had taken place. Von Ruck ex-

tracted the fats and then replaced them in suitable proportions. Douglas and Dreyer apparently try to overcome the difficulty by removing them altogether or nearly altogether, for what reason it is hard to discover, for it is essential to induce antibodies to this fatty constituent, just as it is essential to produce antibodies to the protoplasm and ferments of the tubercle bacillus. Human type tubercle bacillus solution (*H. T. S.*) is a complete antigen. Being a complete solution of virulent tubercle bacillus in benzoyl chloride it contains everything that the tubercle bacillus has, inducing the formation of antibodies to all these substances when injected into the animal body. It is the most complete and powerful antigen yet produced. It is not possible to cure a mixed infection such as open tuberculosis with a single antigen. It is essential to use autogenous antigens of the catarrh-producing infections in such cases, or in bone or joint tuberculosis, septic infections, or rheumatic infections, so constantly present. Diagnostic doses of H. T. S. not only do good but never fail to make a diagnosis of active tuberculosis. All cases that react have tuberculosis, fall of temperature or relief of symptoms being as significant as a rise or increase in symptoms. Those who develop clinical tuberculosis have a lowered resistance. Resistance can be made normal by inoculation with a tuberculous antigen.—*The Treatment of Tuberculosis by Tuberculin, W. M. Crofton, Brit. J. Tuberc., April, 1924, xviii, 54.*—(*B. T. McM.*)

Tuberculin Treatment.—Only tuberculins or preparations made from tubercle bacilli can be considered specific agents. The main symptom of tuberculin reaction is the focal reaction. Tuberculin is only an aid to nature, and proper doses stimulate the protective powers of the tissues, while too large doses destroy or inhibit, and too small doses are valueless or sensitize in an undesirable manner. Resistance to tuberculin is not to be considered as paralleling the immunity to tuberculosis. Whether habituation to large tuberculin doses is to be considered a gain for the diseased body seems questionable. In definitely active, progressive processes it rarely occurs that large tuberculin doses are tolerated, but in cases tending to heal this is more likely. The importance of proper dosage is to be stressed. To attempt to use tuberculin in every tuberculosis case would be wrong. Every case should be kept 1 to 2 months under observation first. If the disease progresses unchecked tuberculin may be of no value. The field of action of tuberculin is in cases with definite tendencies to healing that do not satisfactorily proceed by themselves, and even here too large stimulating doses must be avoided on account of the danger of harm. Focal and marked general reactions are to be avoided. In individual cases they may be of value. Of greatest importance for the proper carrying out of tuberculin treatment is the qualitative diagnosis of the pulmonary tuberculosis. Tuberculin is superfluous in beginning pulmonary tuberculosis, pretuberculous cases, the majority of hilum tuberculosis, and the primary effects. On the other hand, tuberculin gives good results in bronchial catarrhs based on bronchial lymph node tuberculosis as well as asthma caused by these. It is unnecessary in fully healed tuberculosis. A positive tuberculin reaction is no index of its use. The Ponndorf procedure is not without danger, the Petruschky inunction procedure can under certain circumstances be harmful in severe cases, and in many cases the amount of resorbed tuberculin is too small to be useful. Tuberculin is not an agent for the use of the general practising physician.—*Spezifische Behandlung der Tuberkulösen ausserhalb von Heilstätte und Krankenhaus, E. Romberg, Ztschr. f. Tuberk., September, 1922, xxxvi, 492.*—(*H. J. C.*)

Immunity in Treatment of Tuberculosis.—The word *resistance*, suggesting an active combat with the infecting agent, suitably defines the modern conception of immunity. Resistance, immunologically, implies the use not only of cellular and humoral factors, but also of all those silent forces of the human body which we may justly term the anatomic and mechanical defences. The latter includes the unbroken front of the epithelial surfaces, the cilia, the impervious basement membrane of the mucosa, the bronchial secretions, the fascial planes and the like. But lymphatic filtration probably offers the greatest barrier to successful entrance of microörganisms. The lymphatic system is a closed system interposing a layer of endothelium between tissue space and lymph vessels. As a corollary it is pointed out that histological tubercle is avascular and is not penetrated by newformed blood vessels like granulation tissue; hence it is difficult to cause penetration of therapeutic remedies into the heart of the tubercle. In the scheme of resistance the fibroblast is important. It would seem to occupy a reserve line of defence behind the phagocyte fashioning layer after layer of connective tissue around the tuberculous focus. Of recent years cellular resistance has rather fallen into the background in our conception of immunity against tuberculosis. The phagocyte does not stand

alone; its work is done in collaboration with tissue juices and blood plasma, and who shall say which plays the major part? Signs are not wanting that we are at last discarding some of the more elaborate theories of immunity in favor of a physicochemical explanation which will bring the subject of humoral resistance into line with physiological processes. It is customary to regard the humoral mechanism of resistance as an interaction between antigens and antibodies. By this phrase, we mean that two different substances, each having the physicochemical properties of colloids, have undergone a biochemical change; but we have not really offered any explanation of immunity. We know that agglutination, precipitation and complement fixation will take place if certain empirical laboratory rules are observed, but the principles underlying them are still obscure. Apparently the antigen-antibody combination comprises many stages, chiefly physical in character. Some of these stages, such as complement fixation and precipitation, are demonstrated, but they have been preceded by a series of changes, such as alterations of surface tension and adsorption, which we have not detected. In conclusion, rules are suggested for assessing the value of any immunological remedy. As applied to the patient, these concern the presence or absence of tubercle bacilli in sputum, the undergoing of a preliminary period of observation, the proper tests of improvement, and the use of radiograms to support stethoscopic and other physical signs. With regard to the remedy, the importance of the nature of the strain of bacillus, its virulence and age, and the method of preparation of the vaccine or soluble toxin used are stressed. It must be remembered that there is no really reliable method for standardizing an antiserum for tuberculosis, such as is done in the case of antidiphtheria serum. Immunology has not provided a specific cure in tuberculosis, and much laborious laboratory and bedside work is required before we can get in sight of victory.—*The Principles of Immunity in the Treatment of Tuberculosis, S. R. Gloyne, Tubercle, April, 1923, v, 319.—(J. S. W.)*

Significance of Subcutaneous Tuberculin Test in Advising Treatment for Tuberculosis.—The question whether all cases of tuberculosis should be treated cannot be answered uniformly. The necessity for treatment is related to the appearance of anergy. Only after repeated tuberculin injections can the proper interpretation be made. A single reaction indicates the presence of tuberculosis but without guarantee of its duration. Sanatoria can play an important part in preventing tuberculosis from becoming infectious.—*Sollen alle Tuberkulöse behandelt werden? (Beitrag zur Bedeutung der subcutanen Tuberkulin-diagnose für die 'Behandlungsbedürftigkeit der Tuberkulose), C. Kraemer, Ztschr. f. Tuberk., April, 1923, xxxviii, 28.—(H. J. C.)*

Experimental Antituberculous Serotherapy.—Jousset has prepared a serum which he believes to be primarily antitoxic and secondarily antimicrobic and which favorably influences tuberculosis in the guinea pig. Lowering of temperature, increase in weight, diminished tuberculin sensitiveness and a change in character of the local lesions are said to be among its effects. These results are rapid and clear cut and paralleled by clinical experience.—*Résultats expérimentaux de la sérothérapie antituberculeuse, A. Jousset, Meeting, Soc. Méd. d. Hôp. d. Paris, May 30, 1924, reported in Presse Méd., June 4, 1924, no. 45, p. 493.—(A. P.)*

Rare Effects of Tuberculin.—The occurrence of herpes zoster twice, in a young man 23 years of age, after the administration of 0.5 mgm. O.T., is recorded. In 2 female patients there occurred Quincke's edema after the administration of 0.000,005 mgm. O.T. In a 41-year old man there resulted a periodontitis twice, an urticaria in a 6-year old girl, a polyneuritis in a 25-year old woman, two cases with purpura and two with pain at the phrenic pressure point, following the administration of O.T. A woman 42 years of age having received tuberculin for 3 months without ill effect finally developed severe anaphylactic shock after 0.2 cc. of full-strength tuberculin.—*Seltene Vorkommnisse im Verlaufe der diagnostischen und Therapeutischen Anwendung des Tuberkulins (Herpes Zoster; Quinkesches Ödem; Periodontitis; Urticaria; Purpura; Polyneuritis; Phrenikusdruckpunkte; anaphylaktischer Shock), E. Hoke, Ztschr. f. Tuberk., July, 1923, xxxviii, 346.—(H. J. C.)*

Ponndorf's Vaccines in Treatment of Pulmonary Tuberculosis.—The Ponndorf treatment was given, on the average, 3 to 4 times to 71 men and 32 women. An increase of cough and expectoration occurred commonly, chest and back pains in a smaller number, dyspnea rarely and an increase of physical signs among 18 of the men and 16 of the women, especially of those in the more severe stages of the disease. The view of Ponndorf that hemorrhage does not contraindicate treatment is distinctly opposed. Rapid improvement of general well-being and

rapid weight increase were also not noted. The rapid change of conditions noted by Ponndorf after the first treatment also was lacking. Accidents were more common following treatment the more advanced the case. The Ponndorf treatment in no wise equals the subcutaneous tuberculin therapy, nor can it be compared with the latter for exactness of dosage or value.—*Die cutane Tuberkulinbehandlung nach Ponndorf mit Koch Alttuberkulin und Ponndorf's Hautimpfstoff A u. B., G. Schellenberg, Beitr. z. Klin. d. Tuberk., April, 1923, lv, 69.*—(*H. J. C.*)

Ponndorf's Treatment in Tuberculosis of Guinea Pigs.—Inconstant results were obtained in the animal experiments. Ponndorf's therapy cannot be indifferently applied to all cases, but if used in a suitable case it may serve to aid the natural healing processes in tuberculosis.—*On the Influence of Tuberculin Skin Inoculation Against Tuberculous Guinea-Pig, A. Imamuro and K. Nakada, Kekkaku, June, 1923, i, no. 3, Abstract from Japan Med. World, February, 1924, iv, 44.*—(*M. M.*)

Ectebin in Treatment of Tuberculosis.—In 20 cases treated percutaneously there was noted an average increase in appetite, disappearance of lassitude, a slow decrease of expectoration and, in individual cases, also disappearance of fever. The pulmonary findings in two-thirds of the cases showed a favorable tendency to fibrosis, one case after two inunctions progressed, and the remainder were uninfluenced. A combination light therapy is advantageous.—*Erfahrungen mit Moro's Ektebin bei Erwachsenen. Zugleich ein Beitrag zum Problem der percutanen Tuberkulosebehandlung, L. F. Weig, Beitr. z. Klin. d. Tuberk., April, 1923, lv, 101.*—(*H. J. C.*)

Internal Administration of Partigens.—Tuberculin is destroyed by the action of the gastrointestinal ferments, but the protein fraction of the tubercle bacillus is not. The partigen *MTbR* is quite resistant to the action of the digestive enzymes, and may be administered by mouth with good effect. It is best given by the drop method in increasing doses, once a day on an empty stomach. It can be taken in tea or any other liquid medium. It is well to begin with 2 drops of a 1 to 100,000 million dilution and increase the dose 2 or 3 drops a day. The simplicity of the method recommends its use to the practising physician to whom the apparatus for the usual technique is unavailable.—*Ueber Tuberkulin und Partigene, G. Deycke, München. med. Wchnschr., April 25, 1924, lxxi, 548.*—(*E. R. L.*)

Petruschky's Inunction Method.—Inunction with *linimentum Petruschky* is a method of mild tuberculin therapy, and as such can lead to fever and focal reaction, and thereby cause profit or harm. In general the reactions are milder and appear more slowly than after tuberculin injection or the Ponndorf inoculation. Therefore, tuberculin injury is rarer but it can occur. The inunction method has a favorable effect on weight, appetite and general well-being. Fever may be reduced and toxic manifestations made to disappear. Too strong doses, however, may call them forth or increase them. Ambulant treatment is possible and is recommended.—*Erfahrungen über Einreibungen nach Petruschky, G. Pohl-Drasch, München. med. Wchnschr., May 23, 1924, lxxi, 678.*—(*E. R. L.*)

Friedmann Vaccine in Surgical Tuberculosis.—The Friedmann vaccine was used on early active cases; 5 with spondylitis, 28 with joint affections and 24 with other types (bone, urogenital, peritoneal and tendosynovitis) of surgical tuberculosis. Cases combined with pulmonary tuberculosis, as well as markedly febrile and cachectic cases, were excluded. Older forms of tuberculosis were included. The results were unsatisfactory in spondylitis but somewhat better in joint tuberculosis. When results were obtained they were attributed to the ordinary conservative treatment, and not to the Friedmann treatment. In many cases, in spite of the Friedmann treatment, operative intervention was found necessary. Only 5 cases became healed and it is questionable whether this would not have occurred without Friedmann treatment.—*Die Erfahrungen mit dem Friedmannschen Tuberkulose-Heil- und Schutzmittel bei Chirurgischer Tuberkulose an der Königsberger chirurgischen Universitätsklinik, B. Hein, Deutsche Ztschr. f. Chir., 1923, clxxviii, 172.*—(*H. J. C.*)

Results of Friedmann Treatment as Shown by X-ray.—X-ray plates together with case histories in twelve patients with pulmonary or bone and joint tuberculosis are published, showing the favorable influence of the Friedmann therapy. Although it is recognized that tuberculosis is a disease with self-healing tendency, X-ray findings indicate definitely that the Friedmann injections accelerate recovery.—*Röntgenologisches ueber Tuberkulöse und die Umstimmung des Krankheitscharacters im Sinne spezifischer Heilung durch das Friedmann-Mittel, H. Engels, München. med. Wochnschr., March 7, 1924, 289.*—(*E. R. L.*)

Vaccine Treatment of Colds in Tuberculosis Patients.—The effect of a "vaccine

for colds" (Parke, Davis & Co.) was tried on a number of tuberculosis patients, suffering from constant colds. The results were disappointing. Out of 28 cases treated 16 did well, but in 12 the colds became distinctly worse and the condition of the patients was certainly not improved. A detoxicated vaccine (Genatosan Ltd.) was then tried. The results were better, but 2 out of 6 had severe reactions. At present a sensitized vaccine is being used and to date no ill effects have resulted from it. An attempt was made to determine the cause of the poor results with the "vaccine for colds." The presence or absence of tubercle bacilli in the sputum seems to be immaterial. Sensitiveness to tuberculin is the important factor. A patient who is intolerant to a small dose of tuberculin is intolerant to a much larger dose of another vaccine. The blood pressure, so important in treatment with tuberculin, does not affect vaccine treatment. *Conclusions:* Vaccines for colds should be used with caution in the tuberculous if there be a tendency to sensitiveness to tuberculin. The initial dose should be smaller than that usually given and rapid increment of dose should be avoided.—*The Treatment of Colds in Tuberculous Subjects, F. G. Gunter, Brit. M. J., March 15, 1924, no. 3298, p. 403.*—(*B. T. McM.*)

Serum for Tuberculosis.—Uhlenhuth's favorable report on the effect of his serum for tuberculosis, in Czerny's clinic, has prompted Kraemer to make public his somewhat similar experience with one case treated twenty years ago. The patient was a woman, 24 years of age, with tuberculosis of the lungs and larynx, and relatively few bacilli in the sputum. She was given nine injections of a serum obtained from a cow which had been previously inoculated with both human and bovine bacilli, but which showed no effect from the supposed lethal dose. Immediately after the last serum injection, the woman was given 27 injections of O. T. and 5½ months later a further series of 13 tuberculin injections. Recovery was very rapid, and permanent, as shown by the report twenty years later. —*Beitrag zur Wirkung des Tuberkuloseserums, C. Kraemer, Jahrb. f. Kinderhk., 1924, civ, 304.*—(*T. C. H.*)

Action of Bile on Tuberculosis.—*On the Action of Bile Against Tuberculosis, I. Takahashi, Nippon-No-Ikai, August, 1923, xiii, no. 33, Title from Japan Med. World, December, 1923, iii, 278.*—(*M. M.*)

Therapeutic Value of Artificial Jaundice Serum in Tuberculosis.—It is believed that catarrhal jaundice may arrest the progress of a tuberculous infection, but the active principles in producing this reaction are not found in the serum, since the serum from toluylendiamin-jaundiced animals proved of negative value.—*On the Therapeutic Value of the Artificial Jaundice Serum Against Experimental Tuberculosis, B. Yamamoto, Kekkaku, June, 1923, i, no. 3, Abstract from Japan Med. World, February, 1924, iv, 44.*—(*M. M.*)

Leysin and Rollier.—A visit to Leysin is described by the author, a British surgeon. He found that Rollier considers proper splintage of supreme importance and that exposure to the sun is rather a preventive measure, a means of developing the vitality of the whole body and the function of the skin in delicate children, or those thought likely to have had massive tuberculous infection in their homes. Rollier's aims are summarized as follows: (1) development of health and vitality, (2) development of skin function by exposure to the sun and air, (3) correction of deformity, (4) healing of disease, (5) freedom of the affected joint from covering, and (6) extension and maintenance of mobility. The whole of Rollier's treatment is carried on in bed. When the disease is believed to be healed, the patient gets up for a test period of six to eight weeks, and then goes home "cured." Counterirritation is much used in synovial cases, even the actual cautery. Rollier aims always at securing mobility in an affected joint. He allows a little movement during treatment and tries to get all the movement that is possible at the end of treatment. The unnecessary opening of a cold tuberculous abscess is deemed "criminal, almost a condemnation to death, not at once but in two or three years." Despite the great things accomplished by Rollier at Leysin, the author believes that a good distant hospital cannot compete with good local hospitalization which includes after-care; that a hospital in Switzerland, even with climatic advantages, cannot do as much for a Yorkshireman as a hospital in Yorkshire.—*A Visit to Leysin and Dr. Rollier, G. R. Girdlestone, Brit. J. Tuberc., July, 1924, xviii, 95.*—(*J. S. W.*)

Heliotherapy.—The sun treatment of pulmonary tuberculosis has fallen into disrepute and is generally considered dangerous by experienced medical officers at sanatoria. This is because sun treatment has frequently in the past been tried on pulmonary cases in sun boxes open only to the south or under glass, and because febrile cases have been submitted to conditions which overheat in

place of cooling the body. The indiscriminate and uncontrolled use of the sun in pulmonary tuberculosis is fraught with danger and must be discouraged. It is not a hot sun, but pleasantly warm sunlight and cool air that are required. The treatment should be done, as far as possible, in the open, with cool fresh air circulating round the patient. Heliotherapy may be tried in tuberculosis of the lungs, when the disease is of the localized, simple focus type, thereby approximating in character surgical tuberculosis. In cases in which there is no fever and the activity of the disease has become arrested, but which are "sticking" and still have sputum containing tubercle bacilli, much benefit may be derived from a course of sun baths. When the disease is of the scattered type, and especially when there is a liability to fever, either periodical or continuous, sun bathing is dangerous and should not be attempted. Cases which easily auto-inoculate themselves and those who are prone to hemoptysis should avoid exposure to the sun, but such cases are benefited by exposure to the cool air and ultraviolet radiation of the sky. With sun exposure good results have been obtained in those instances in which the disease is of the pleural type; the pleural thickening and adhesions are absorbed and cleared up, the lung expands and functions again, and there is great general improvement in health. Another type which does well is the bronchial asthmatic. As a general rule it may be stated that when there is smouldering activity of the tuberculous process, as evidenced by fever, a tendency to auto-inoculate on exertion, hemotypsis and other signs and symptoms of activity, the sun-bathing must be left alone, and the ordinary treatment of rest and open air carried out. Sun-bathing may be used as an additional stimulus to a case which is becoming cured, but in which progress is slow.—*Some Clinical Observations on Heliotherapy in Pulmonary Tuberculosis, B. Hudson and L. Hill, Lancet, June 7, 1924, ccvi, 1147.*—(*B. T. McM.*)

Artificial Heliotherapy.—Lupus vulgaris of the skin is healed by combined local and general light exposures, in almost 90 per cent of cases. Extrapulmonary tuberculosis in many forms yields to sunlight and artificial light radiations. These results have been so clear-cut and yield so much promise that a knowledge of light and its clinical applications has become a requisite not only of the physiotherapist but also of the general practitioner. Vibrations of all wave-lengths appear to possess some light, heat, and the ability to hasten or influence chemical reactions. As a rule, heat production is chiefly associated with the infrared and the red rays; light is chiefly associated with the range from red to violet, while the most active rays chemically are the ultraviolet, blue, indigo and violet. Quartz and fluorite glass and clear distilled water are practically the only substances that do not absorb ultraviolet rays to a very great extent. Ultraviolet rays lose about 60 per cent in intensity in penetrating the atmosphere before reaching the lowlands. Ordinary window-glass absorbs ultraviolet rays below 330 millimicra. Snow, ice, water and sand increase ultraviolet intensity by reflection. Ultraviolet rays are rapidly absorbed by most tissues to a depth, however, of approximately only one millimeter. Only those rays that are absorbed can induce chemical changes. Bacteria are rapidly destroyed by these rays, the bactericidal effect becoming more marked as the wave-length decreases. Temperature elevation increases this destructive action, while changes in the hydrogen-ion concentration appear to play no significant rôle. Red blood-cells are quickly destroyed *in vitro* but not *in vivo*. Under solar radiation the blood shows increased alkalinity, and this all the more under the action of the heat rays. From an apparently lifeless, toneless and flabby skin, light exposures may produce a soft, velvety, colorful tissue. Under exposure to solar radiation remarkable muscular tonus has been produced in unused muscles, despite prolonged application of immobilizing casts. Under light exposure the skin develops increased respiratory, excretory and protective power. The possibility of stimulation of the skin to produce so called "antibodies" cannot be entirely discarded. Certain diseases are more easily responsive to sources of greater intensity in ultraviolet radiations than to solar radiation. Empirically this has been noted in certain forms of tuberculosis. The quartz-mercury-vapor light has a preponderance of the short ultraviolet rays, but also emits the long ultraviolet, the blue, indigo and violet rays, and some infrared and green rays. Heat particularly comes from the heated mercury and tungsten electrodes, the quartz container and the reflecting hood. The carbon arc emits wave-lengths similar to those of sunlight, but with a preponderance of infrared and longer ultraviolet rays. There is abundant proof of the efficacy of light therapy in intestinal tuberculosis. A type of tuberculosis in which it appears that the importance of the favorable influence of light action has not been sufficiently stressed is hilum tuberculosis. It has been shown that healing takes place in 30 per cent more of cases of lupus vulgaris when general body irradia-

tions are used in addicts to local exposures. *Conclusions:* Light may be particularly advocated as an adjuvant in bone, joint, peritoneal, fistulous and lymph node tuberculosis. Reliance on its use in pulmonary tuberculosis is not to be particularly encouraged. The chief object of this presentation is to hint at the future possibilities of light therapy, which will require closer coöperation between clinician, laboratory experimentalist and physicist.—*Artificial Light Therapy in Tuberculosis, E. Mayer, J. Am. M. Ass., June 14, 1924, lxxxii, 1920.—(B. T. McM.)*

Quartz Lamp Treatment of Pulmonary Tuberculosis.—The most exacting skeptic cannot deny the value of the quartz lamp in the treatment of lymph-node and bone tuberculosis, although many question the wisdom of using light therapy in pulmonary tuberculosis, for in this form of the disease there may be a temporary improvement in symptoms after ray treatment but this is followed by a return of symptoms and continuance of signs. After a study of 356 cases of pulmonary tuberculosis during quartz-lamp radiation a basis of prognosis is worked out. The normal leucocyte and differential counts are determined in the case. Then, after three weeks of treatment, new blood studies are done. On a basis of the lymphocytosis, normal lymphoid cell count or lymphocytic decrease in relation to the Arneth scale, the prognosis is good, fair or poor.—*Höhensonnenbehandlung der Lungentuberkulose und ein neues hämatologisches prognostisches Wertbild, Fecht, Deutsche med. Wchnschr., January 25, 1924, 1, 114.—(H. S. W.)*

Treatment of Tuberculous Peritonitis with Artificial Sunlight.—The conservative treatment of peritoneal and mesenteric lymph-node tuberculosis combined with artificial sunlight gave good results; the raying achieved best results in the exudative forms of children, but it was also efficacious in the dry adhesive forms of children as well as the peritoneal tuberculosis of adults. Seven per cent became worse with fever and ascites, 7 per cent died, 9.3 per cent were slightly benefited and 76.8 per cent definitely improved. Of the latter, 9 became completely afebrile and ascites disappeared, 14 gained weight and became afebrile and of the remainder in part the ascites, fever and pain or weakness disappeared. The unfavorable course of the ulcerative forms could not be combated by artificial sunlight. —*Über die Behandlung der Bauchfelltuberkulose mit künstlicher Hohensonne, A. Pfefferkorn, Centralbl. f. inn. Med., June, xliv, 353.—(H. J. C.)*

X-Ray Treatment of Laryngeal Tuberculosis.—In the X-ray treatment of tuberculosis the old idea of selective destruction of pathological tissue has given way to the modern attempt to favor scar-tissue formation, the constructive being considered more important than the destructive element. This usually means the use of small stimulating doses. It is not possible to individualize as carefully in the treatment as might seem theoretically desirable, although naturally the treatment during its course is controlled by local and constitutional findings. X-ray treatment finds its most favorable application in conjunction with other therapeutic measures, particularly, in the experience of the author, with krysolgan. Beck uses ordinarily two-field raying in one or two sittings with a 3 mm. aluminum filter and a dose of ⅓ *HED* to each field. In consequence of ray absorption structures at a depth of 1 cm. (epiglottis and anterior commissure) receive about 60 per cent *HED*, those at 3 cm. depth (middle of the vocal cords) about 50 per cent *HED* and those at 3 cm. depth (posterior wall) 40 per cent *HED*. The posterior wall thus receives the least radiant energy, although it is the commonest site of tuberculosis. There is some indication, however, that the structures of the posterior wall are more sensitive than other parts to radiation. At any rate it is necessary sometimes to increase the dose so that the posterior parts receive 50 to 60 per cent *HED*. In general, deep nodules and perichondritic processes do not respond as well to X-ray treatment as the superficial and ulcerative, as the results on 200 cases treated in the past year indicate. The majority of these were given combined X-ray and specific or other treatment, but in 13 cases the X-ray was used alone, in all of which the laryngeal tuberculosis complicated advanced pulmonary tuberculosis. Three of the patients became worse, 3 became slightly better, and 7 were absolutely healed in the course of 2 months to 1½ years. It is noteworthy that complete healing occurred in the presence of very advanced lung disease, in both anterior and posterior wall laryngeal lesions.—*Ueber die Röntgenbehandlung der Kehlkopftuberkulose, K. Beck, München. med. Wchnschr., December 7, 1923, 1454.—(E. R. L.)*

X-ray Treatment of Pulmonary Tuberculosis.—Deep, penetrating X-ray treatment in many cases of pulmonary tuberculosis is of great value. Bacilli frequently disappear from the sputum, and constitutionally the patients usually become considerably improved, and many are enabled to return to work. Stimulation of deep-seated tuberculous foci in the lungs

certainly results from deep ray therapy. An occasional patient does not do well. Patients who have already an unfavorable prognosis do not do particularly well with X-ray treatment; at least, this type of therapy does not change a poor prognosis into a good one. The results encourage the continuation of the procedure.—*Zur Röntgentiefentherapie der Lungentuberkulose, H. Schulte-Tigges, Deutsche med. Wchnschr., February 8, 1924, l, 171.*—(*H. S. W.*)

X-Ray Treatment of Surgical Tuberculosis.—Cachectic patients should not be given X-ray treatment until they have had up-building treatment, for in such persons X-ray irritation brings about injury instead of benefit. In other cases, however, especially in joint tuberculosis, restoration is very prompt, the part becoming rapidly smaller and very soon showing a normal contour. The same is true of fistulae, when pus dries and healing occurs. Conservative doses must be used. Those persons with most marked local reactions do the best. Frequently the reacting area sloughs; there is a lymphangitis with swelling and pain of the regional (axillary or inguinal) lymph nodes. Healing occurs in a goodly percentage of cases: in the tuberculosis of the soft parts six or eight weeks' treatment (two or three treatments) is sufficient; in bone or joint disease about six months of treatment is required. Curative results follow this type of treatment when applied to nontuberculous fistulae.—*Zur kombinierten Röntgenbehandlung der chirurgischen Tuberkulose, K. Stettner, Deutsche med. Wchnschr., February 29, 1924, 1, 271.*—(*H. S. W.*)

Deep Roentgen Treatment of Pulmonary Tumor Metastases.—The well known frequency of invasion of the lungs by malignant metastases is based on anatomic reasons: the richness of the intrathoracic structures in blood and lymphatic vessels, and the proximity of certain organs in which malignant tumors frequently develop, such as the breast, stomach, liver and pancreas. Until the advent of radium and roentgen therapy, there was no method of even partial relief. In treating lung tumors one must consider the necessary dosage of radiation for the tumor cells, and the protection of normal lung tissue from damaging changes. As a rule, neoplastic tissues show a decreasing sensitiveness toward repeated irradiation, normal lung tissue the reverse. Thus, the early or first doses are most effective. Another important point is that the more nearly the tumor cells approach the embryonal type, the more susceptible they are to radiation. Among the extremely embryonal types are angiosarcomata. In one such case the lungs became clear three weeks after a single treatment. On the other hand, metastases of periosteal sarcomata appear to be entirely refractory. Carcinoma metastases have been treated with varying degree of success; the circumscribed mediastinal metastases are the most amenable to treatment; the miliary type, the least so. The chief complications met with which are directly due to the radiation are hemorrhage due to extensive necrosis, rupture of the lung from the same cause, and hepatization or fibrosis of normal lung tissue, due to overdosage. Dosage up to 60 or 70 per cent *S. E. D.* over the entire lung may be considered safe; over 100 per cent *S. E. D.* is likely to produce infiltrative changes which, however, may disappear by resorption in two to six months; over 130 per cent *S. E. D.* will in most cases bring about a progressive fibrosis. The greater the number of exposures, the greater the danger. However, it cannot be said that a standard or so called lethal dose for sarcoma or carcinoma exists, because the tumor tissue alters the permeability toward radiation according to its density and arrangement. For lungs infiltrated by metastatic masses an optimum effective dose will be somewhere between 100 and 130 per cent *S. E. D.*, which is usually projected into the lesion as a nonconcentrated massive dose spread over several days, giving four to six hours' exposure each day. The lesion is crossfired from different directions. Using this technique the lung tissue is pretty well protected from serious damage, and most of the patients after successful treatment have been able to return to work without showing respiratory disturbances. A peak-load of 200,000 volts is used, with 1.3 mm. copper and 1 mm. aluminum filters, *S. T. D.* 40 to 60 cm. Some coincident general systemic treatment is also advised, such as irradiation of the spleen, prolonged use of iron and arsenic, hypodermoclyses of saline solution, and intravenous injection of electroferrol in the postradiation period. While it is too early to make any statement about ultimate or curative results, several patients have returned to a state of apparent health, without signs or symptoms of other metastases for over a year. Uniformly good results were accomplished in 7 cases of lymphosarcoma treated by heroic irradiation of the whole lymphatic system.—*Deep Roentgen Therapy of Neoplastic Pulmonary Metastases, W. A. Evans and T. Leucutia, Amer. J. Roentgenol. and Rad. Therap., January, 1924, xi, 35.*—(*A. P.*)

Experimental Chemotherapy of Tuberculosis.—Chemotherapeutic studies on white mice are reported. The animals were

given 0.5 mgm. of a virulent avian tubercle-bacillus strain by intraperitoneal injection and inhalation. A uniform disease was thus obtained, causing death in 30 to 60 days. The tests involved the use of a series of parasitotropic substances, given repeatedly for 3 to 10 times intravenously for periods up to 2 weeks. No parasiticidal action was noted, but the duration of life was lengthened to 200 days. The differences are tablated. Quinine, arsenicals, benzidin dyes, trypan-red, Bayer 205, colloidal silicic acid, creosote, xylene and acetone were without effect. Iodides and heavy-metal compounds prolonged life. Potassium iodide, *iod-collargol*, iod-silver methylene blue, iod-silver trypan-blue, *Copper silicate solution-Linden*, collargol, silver-chloride fuchsin, aurokantan, keysolgan, gold salvarsan, and various organic mercury compounds (Höchst) were used. The view is taken that the action noted is nonspecific and not due to any direct bactericidal or inhibitory influence upon the tubercle bacillus.—*Chemotherapeutische Versuche bei Tuberkulose, W. Kollen and H. Schlossberger, Ztschr. f. Hyg., June, 1923, c, 107.*—(*H. J. C.*)

X-Ray Treatment of Tuberculosis of Cervical Lymph Nodes.—*X-Ray Treatment of Tuberculosis of the Cercival Lymphatic Glands, M. Ikeda, Iji-Shimbun, July, 1923, no. 1122, Title from Japan Med. World, December 15, 1923, iii, 277.*—(*M. M.*)

Chemotherapeutic Studies in Tuberculosis and Leprosy.—As early as 1916 the action of the chaulmoogra oil derivatives in leprosy suggested their trial experimentally in tuberculosis. In March, 1920, Walker and Sweeney recorded important tests of the action on acid-fast bacilli *in vitro* of the sodium salts of different fractions of the chaulmoogra-oil acids. They found those of the total fatty acids most active, and specific for acid-fast bacilli, being 100 times as active as pure phenol. Recently Schöbl in the Philippines has studied the effects on tubercle bacilli when added to culture media of measured amounts of 42 different oils, confirming in considerable measure the conclusions of Walker and Sweeney. Using solid media he found the oil from *Hydnocarpus Wightiana* most inhibitory (1–10,000, or five times stronger than true chaulmooga oil from *Taraxtogenos Kurzu*); of the salts, the gynocardates were most active and sodium hydnocarpate was 20 times as powerful as the chaulmoograte. Of the other oils tested, only cinnamon oil equalled chaulmoogra oil, and the former was also effective against non-acid-fast bacilli. There are two serious difficulties, however, in accepting the direct action theory of chaulmoograte on leprosy *in vivo*; first, that marked and continuous improvement, even complete recovery often follows a single minute intravenous dose, and, second, that sodium morrhuate and other preparations which have little or no direct action are quite effective clinically. Therefore, Rogers believes that there must be a chemical reaction with the fatty acids in the coating of the bacilli, probably through the intermediary action of blood lipase. A great reduction of blood lipase has been observed during severe reactions, and an increase in cases progressing favorably. In working with tuberculosis the dangers and difficulties are greater than with lepsosy, and as sodium gynocardate is irritating when given other than intravenously, a preparation was made from codliver oil which was called sodium morrhuate; this was found to be painless, subcutaneously, in a 3 per cent solution, and gave some encouraging clinical results in India. In England in 1920, some experimental work was instituted in Griffith's laboratory in Cambridge, using virulent human and bovine bacilli sufficient to kill within a few weeks. Under these conditions no results were obtained from either chaulmoogra oil or codliver oil derivatives. There is, however, little analogy to the chronic pulmonary tuberculosis of man. Voegtlin, Smith and Johnson, Kolmer Davis, and Jaeger, and F. Leuret also obtained negative experimental results with the chaulmoogric derivatives. Beasley, using Dean's ethyl chaulmoograte obtained focal lung reactions like those produced by tuberculin. The reports on sodium morrhuate, at least from the clinical side, in tuberculosis have been more encouraging. Tewksbury observed an apparent breaking up of the tubercle bacilli in the sputum and a tendency to their diminution or disappearance. Boelke, of Sydney, Australia, made some rather extravagant claims that others have failed to substantiate, but the drug does seem capable of effecting remarkable improvement in a certain proportion of advanced cases. In surgical tuberculosis the work at Fazakerley indicates a specific action on tuberculous tissues, while Lloyd concludes that in pulmonary tuberculosis it is harmless and has yielded better results than any other form of treatment. Pure codliver oil has also been used intramuscularly diluted with an equal amount of olive oil to prevent pain. William and Forsyth, and Campbell and Kieffer have shown a definite effect on tubercle bacilli when codliver oil was added to the culture media. Combined sodium morrhuate and tuberculin injections are also suggested. Invaluable as are the effects of sanatorium treatment no

one can doubt that the ultimate results still leave ample room for improvement.—*Croonian Lectures on Researches on Leprosy and Their Bearing on the Treatment of Tuberculosis, L. Rogers, Lancet, June 28, 1924, ccvi, 1297.*—(*A. P.*)

Oxygen in Treatment of Tuberculosis.—Oxygen gas has been used in the treatment of various affections, including psoas abscess, tuberculous peritonitis, tuberculous joints, etc. The author employed this treatment in 20 cases of tuberculous abscess and peritonitis, with the following results: well 10, improved 2, failure 6, died 2, not traced, 1. The results in the peritonitis cases (3) were not striking. The method consists in the evacuation of the abscess, preferably by trocar and cannula, followed by inflation with oxygen gas. In deeply situated abscesses, evacuation by free incision is necessary. The apparatus consists of an oxygen tank, with a wash-bottle containing hydrogen peroxide solution, and an aspiration needle or hydrocele cannula fitted with a two-way tap, the latter permitting both aspiration and introduction, of oxygen if necessary. Rigid asepsis is essential; the aspirator or trocar should be introduced through sound skin and preferably in such a manner as to produce a valvular closure on its withdrawal. When incision is necessary, the latter is closed in layers, if possible, before the gas is introduced. A similar procedure is applicable to the abdomen. It is best to insert the needle for the introduction of gas at a distance from the incision. Oxygen is introduced until a distention equal to that produced by the pus is obtained. In plastic tuberculous peritonitis the degree of distention is less easy to gauge, but it may be carried to the point of a tight distension, with a high tympanitic note on percussion. Care must be taken to permit the patient to emerge from deep anaesthesia as the gas is being introduced. Cases with sinuses or redness of the skin are not suitable. So far, tuberculous peritonitis with effusion has not yielded any good results. Just what part the oxygen plays is uncertain. MacLeod and Gordon have shown that some bacteria do produce inhibitory substances in the presence of excess of oxygen. May it not be possible that the tubercle bacillus can produce under the same conditions an inhibitory substance?—*Treatment of Tuberculous Affection by Inflations with Oxygen, R. Purves and E. J. Bilcliffe, Brit. M. J., May 24, 1924, 906.*—(*J. S. W.*)

Sodium Morrhuate in Treatment of Tuberculosis.—Eleven cases of pulmonary tuberculosis, all of which received subcutaneous injections of sodium morrhuate are reported. Seven of these were moderately advanced and the rest far advanced. All had tubercle bacilli in the sputum at the beginning of treatment. The dose of the drug ranged from 0.5 cc. to 1 cc. of a 3 per cent solution, usually administered twice a week. Local reactions, if present, were only slight. Of the 11 cases one was arrested and returned to work, 6 were improved, and 3 died within two years. The author concludes from the results that sodium morrhuate is a valuable remedy for the treatment of tuberculosis, especially in early cases.—*The Treatment of Tuberculosis with Sodium Morrhuate, J. Hume, Lancet, July 26, 1924, ccvii, 162.*—(*J. S. W.*)

Toxic Effects of Krysolgan.—A patient with proliferative pulmonary tuberculosis and infiltrative laryngitis developed, after the eighth injection of krysolgan, besides a marked affection of the mucous membranes, a widespread exanthema of the skin associated with a pulmonary focal reaction. These toxicodermic effects with krysolgan are considered anaphylactic in nature, and occasioned by protein split-products which cause inflammation. The capillary theory of Heubner is disputed by Feldt's experiments. The view of Geszti that krysolgan is an indifferent agent is not correct. A brief review is given of the cases suitable for krysolgan, with the results to be expected.—*Ein weiterer Fall von toxischer Stomatitis und Dermatitis durch Krysolgan, Schwermann, Ztschr. f. Tuberk., April, 1923, xxxviii, 97.*—(*H. J C.*)

Copper Therapy in Tuberculosis.—Results with copper continue favorable. The most satisfactory compound for use against tuberculosis is dimethylglycocoll copper. Other preparations are less active. The copper silicate is distinctly harmful, leading to marked vasomotor disturbances, especially in women. The silicate radicle is responsible for this action. Nine cases of laryngeal tuberculosis treated by copper are reported. Marked focal reaction occasionally occurred following the injection of copper. Definite healing took place in certain of the cases which could be attributed to no other therapy than copper.—*Weitere Beobachtungen über Kupfertherapie bei Tuberkulose, G. Pohl-Drasch, München. med. Wchnschr., January 11, 1924, 46.*—(*E. R. L.*)

Phosphorus Treatment of Pulmonary Tuberculosis.—A number of severe cases of tuberculosis were given small doses of phosphorus (in slowly increasing amounts, 2, 4, 6 to 8 cgm.), for months with beneficial

results. It is believed that the phosphorus calls forth a stimulation of bony tissues, with a tendency to an increased deposition of calcium salts. The phosphorus dosage as used commonly in codliver oil is considered too large. At the same time lime is given, since lime and phosphorus have a reciprocal action.—*Phosphorbehandlung bei Lungentuberkulose, Rückle, Ztschr. f. Tuberk., April, 1923, xxxviii, 101.*—(*H. J. C.*)

Chaulmoogra Oil and Allied Preparations.—The antiseptic power of chaulmoogra and allied oils as regards inhibition of growth of tubercle bacilli *in vitro* (glycerine-agar) varies widely. The oils fall into three groups. The first contains oils which inhibit the growth of acid-fast bacilli; some of these inhibit growth of both acid-fast and non-acid-fast bacteria; some inhibit the growth of tubercle bacilli and fail to influence growth of non-acid-fast bacteria. The second group is indifferent in its effect upon growth of tubercle bacilli. The third group (only a few) stimulate the growth of tubercle bacilli. Chaulmoogra and hydnocarpus oils, both containing optically active fatty acids, possess the highest inhibition titre, although some of the vegetable oils which do not have optically active fatty acids and some of the essential oils containing volatile substances also have a high degree of inhibitory action on the growth of acid-fast bacilli.—*Chemotherapeutic Experiments with Chaulmoogra and Allied Preparations. II. Comparison of the Antiseptic Power of Chaulmoogra Oil with That of Other Vegetable and Animal Oils, Rare and Common, O. Schöbl, Philippine J. Sci., January, 1924, xxiv, 23.*—(*H. S. W.*)

Remedy for Fever in Pulmonary Tuberculosis.—Of late years the importance of the salicylates and arsenic, formerly extensively used, has been minimized. Experience with many cases justifies the use of these two drugs in combination, as the *Kate* salicyl-arsenipill. These are given three times a day, four or five at each dose; with these are given three or four times a day one *Elbon* tablet. Indications for the combination drug are moderately remitting fever, productive exudative lung tuberculosis. In final stages of tuberculosis or in acute febrile diseases this type of medication avails nothing. Too many cases which have been refractory to other therapeutic measures have become afebrile under such a course of treatment to think of the results as coincidental. This is not a specific but it is a helpful reagent.—*Zur Behandlung des tuberkulösen Fiebers, E. Peters, Deutsche med. Wchnschr., April 18, 1924, 1, 514.*—(*H. S. W.*)

Criteria of Progress in Sanatorium Treatment.—One who works much in tuberculosis sanatoria must be impressed by the lack of unanimity that prevalls as to the exact criteria on which the progress of a patient is assessed, and the preponderating importance often attached to certain changes in physical signs. In dealing with the early stages the criteria may be divided into: (1) physical signs in the chest and (2) signs and symptoms elsewhere; and again into conditions accurately measurable, as temperature, pulse, sputum, and weight, and conditions more dependent on general observation and impression, such as energy, appetite, digestion, facies, and cough. *Temperature:* The normal curve should show a periodic rise and fall with a range of about one or one and one-half degrees. Irregular or extensive curve is indicative of toxemia, as are also persistent subnormal range and excessive sensitiveness to external stimuli. *Pulse:* This is even more liable than the temperature to upsets from external causes and should, therefore, not be registered after any excitement or stimulation, or at a different time of day. The average pulse rate of male sanatorium patients doing well is between 70 and 80, and of females between 80 and 90, any persistent elevation above this indicating a degree of toxemia requiring more rest. One may distinguish: (1) The suddenly rising pulse; (2) the high, swinging pulse and (3) the high, irregular pulse, the latter being especially unfavorable. *Sputum:* This should be charted daily either by volume or weight. A steadily falling or rising curve is of significance; small daily variations of very little importance. *Weight:* Failure to gain at the commencement of treatment under favorable conditions is a bad sign, but mere gain itself is not invariably a good one. *Energy:* This can only be roughly estimated, but no patients who complain of being tired should be moved to a higher grade of exercise. *Appetite:* Partial refusal of breakfast is a danger signal and an indication for reduced exercise. *Facies:* To the experienced eye the facies of tuberculous toxemia even in early cases is characteristic. It is, however, often masked in patients under sanatorium treatment. *Physical signs:* In addition to the well-known changes, variations in muscular tension are important if one be skilled to appreciate them.—*Criteria of Progress in Sanatorium Treatment, J. A. Delmege, Tubercle, March, 1924, v, 270.*—(*A. P.*)

Results of Sanatorium Treatment.—Sanatorium treatment has now been employed in England for over twenty-five years. Because of the different use of the terms "quiescent," "arrested," etc., it is difficult to

get statistics from which valid conclusions can be drawn as to its efficacy. The conception of what is an incipient case may be very different to two different observers. Every sanatorium receives cases with no prospect of recovery which have been regarded by their medical advisers or even by tuberculosis officers as early cases. Physicians who work in sanatoria have no doubt of the value of sanatorium treatment. Who could possibly doubt it who watches case after case come in with symptoms of active disease and a history of steady or intermittent deterioration of health, in which, within a few weeks of admission, the elevated temperature and pulse-rate settle down to normal levels, symptoms of toxemia readily abate, nutrition improves, expectoration diminishes and finally disappears, and capacity for physical exertion increases, while all the evidence points to improvement in the lung condition. But general impressions such as these are not enough. At present a strong effort is being made to ensure uniformity of records. The value of sanatorium treatment is expressed statistically in two forms: (1) the immediate result, as estimated on the patient's discharge; and (2) the ultimate result, according to the patient's condition and working capacity after a period of several years. The value of statistics of the ultimate results is diminished by two factors: (1) that usually a material proportion of cases is lost sight of and cannot be placed in the table of results, and (2) that in the interval other influences have come into operation which are not constant and which affect the ultimate results. Factors which detract from the value of immediate results of sanatorium treatment are (1) the latitude allowed for differences in the judicial qualities of the observer and for personal bias; and (2) looseness in definition of the different groups and difference in the standards of measurement employed. The sanatorium can do little or nothing for the patient in whom severe systemic disturbance exists which does not rapidly abate with rest in bed, no matter whether the lung lesion is in an early or an advanced stage anatomically. The outlook for all cases admitted with slight or no systemic disturbance, even when the physical signs point to extensive but not dense lung disease, is so good that all of these, whether *IA*, *IIA* or *IIIA* cases, deserve long periods of sanatorium treatment, even when tubercle bacilli have never been found in the sputum. The mortality among the negative cases in the years following sanatorium treatment makes it clear that such cases are not to be treated lightly. In most sanatoria the subgroup, *IIIB*, forms a large proportion of the whole, and contains most of the cases whose prognosis is very doubtful. Unless beds are plentiful and financial resources abundant, it is obviously unwise to keep the *IIIB* cases in sanatoria for long periods, especially if new cases have to be kept waiting in their homes for beds to become available. The subgroups, *IB* and *IIB*, have an intermediate prospect of recovery which in the case of the positive class is considerably poorer than for those showing the first grade of systemic disturbance. The *IB* cases certainly should have a trial of sanatorium treatment; the *IIB* cases would be better passed through observation beds. All statistics show how much better the prognosis is when a patient, in whose sputum tubercle bacilli were present, loses them under treatment. Such cases should be kept in the sanatorium for at least three months after the sputum has quite disappeared, or the bacilli from it. There are at present no statistics available which afford scientific proof that patients are not as well without sanatorium treatment. As more uniform methods of classification come into general use it is to be expected that proof will soon be forthcoming.—*The Results of Sanatorium Treatment, J.Watt, Tubercle, August, 1924, v, 513.*—(*B. T. McM.*)

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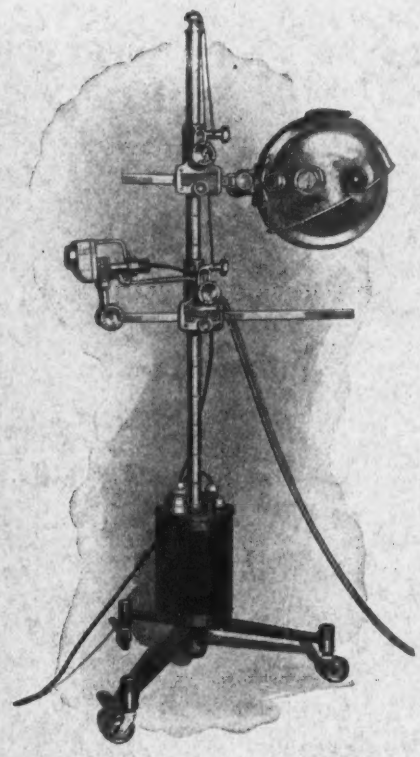

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